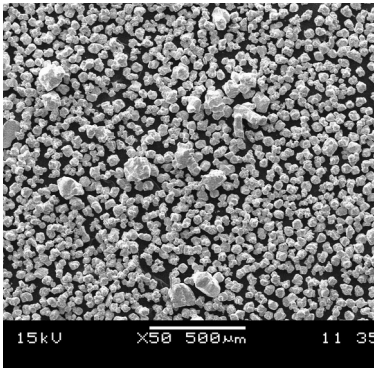
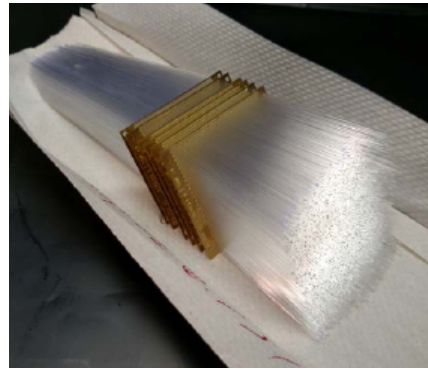


W/SciFi Calormetry

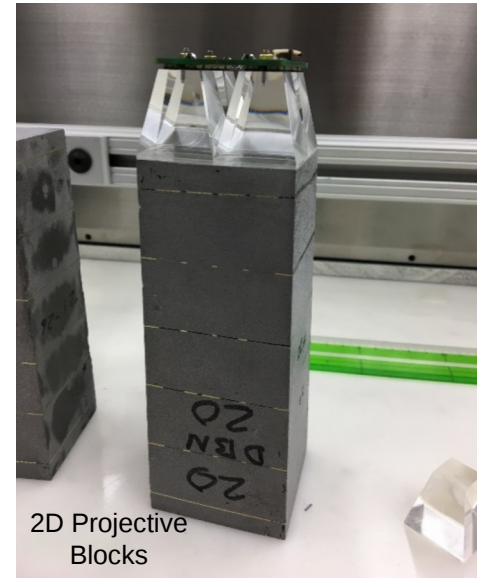
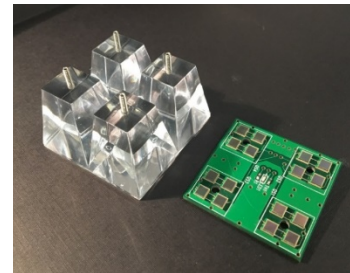
- Absorber consist of a matrix of tungsten powder and epoxy with embedded scintillating fibers (~ 0.5 mm dia., spacing ~ 1 mm, SF $\sim 2\%$)
- Density ~ 9 g/cm³, $X_0 \sim 7$ mm, $R_M \sim 2.3$ cm
- Fabrication of modules requires a labor intensive step of filling fiber assemblies consisting of a series of screens to maintain fiber spacing
- Modules can be made 2D projective (ϕ and η)
- Technology used for the central EMCAL for sPHENIX
- Mass production techniques have been developed at the University of Illinois (UIUC)



W Powder ~ 50 μ m



Fiber Assembly



2D Projective
Blocks

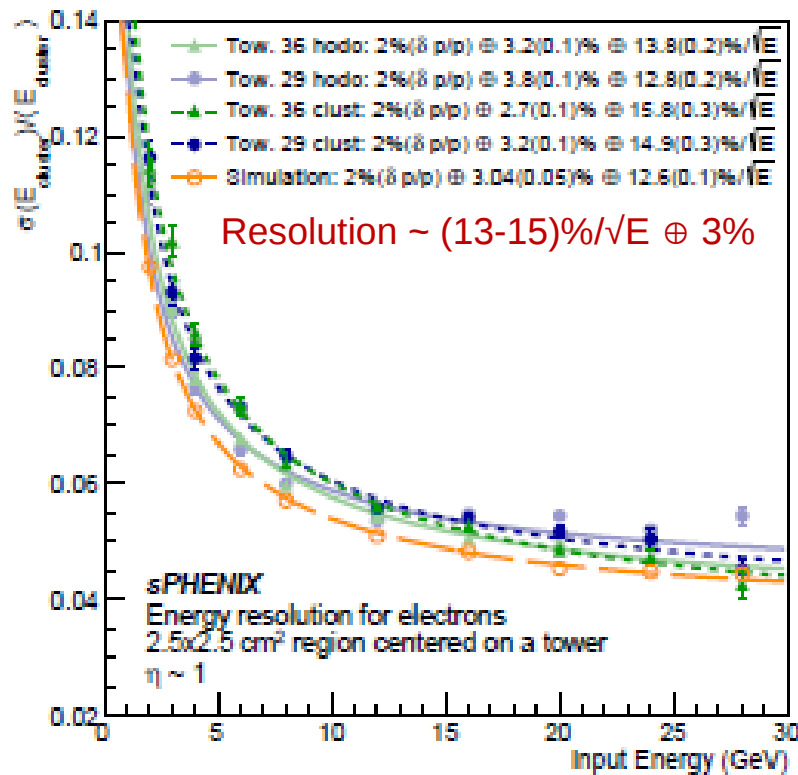


Mold with W powder, fibers + epoxy

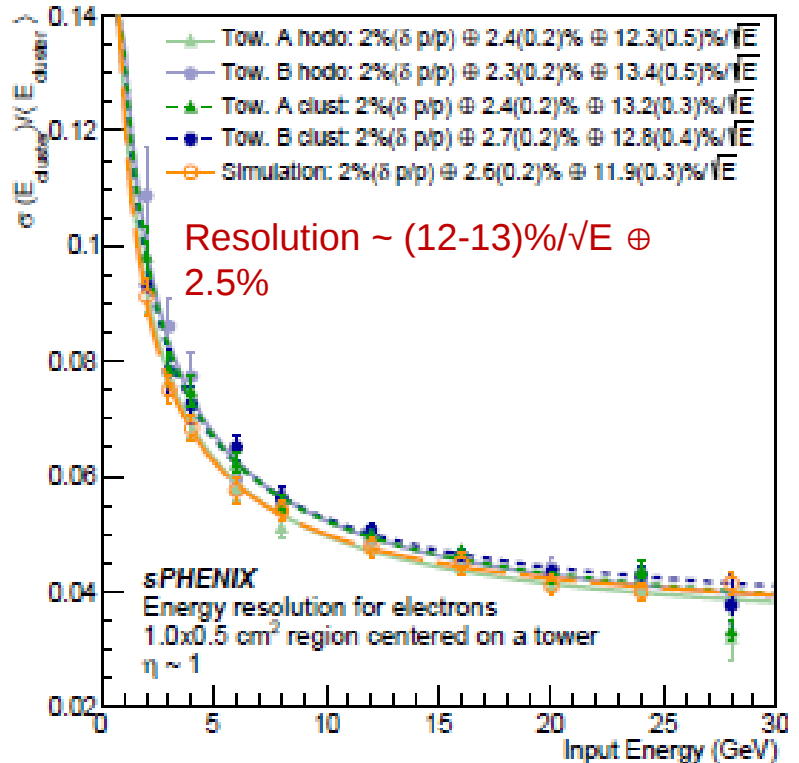
Readout with light guides and SiPMs

W/SciFi Energy Resolution

Energy resolution of the sPHENIX W/SciFi after position dependent correction



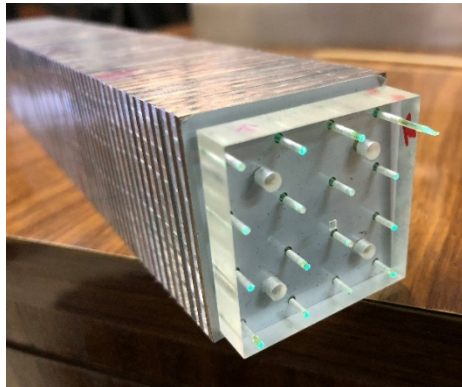
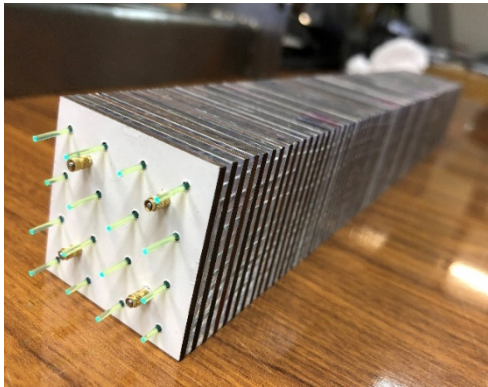
Beam covering a 2.5 x 2.5 cm²
area centered on a tower



Beam covering a 1.0 x 0.5 cm²
area centered on a tower

W/Shashlik Calorimetry

- ❑ A compact shashlik using a high density absorber (e.g., W or a W alloy) can provide energy resolution in the range from $\sim 8\text{-}15\%/\sqrt{E}$ in a limited space.
- ❑ Energy resolution can be tuned by adjusting the sampling fraction and sampling frequency.
- ❑ A compact shashlik also offers the possibility of improving the light collection uniformity due to the short light path to the WLS fibers.
- ❑ Availability of low cost SiPMs allows reading out each fiber individually. This allows determining the position of a shower even within a tower.

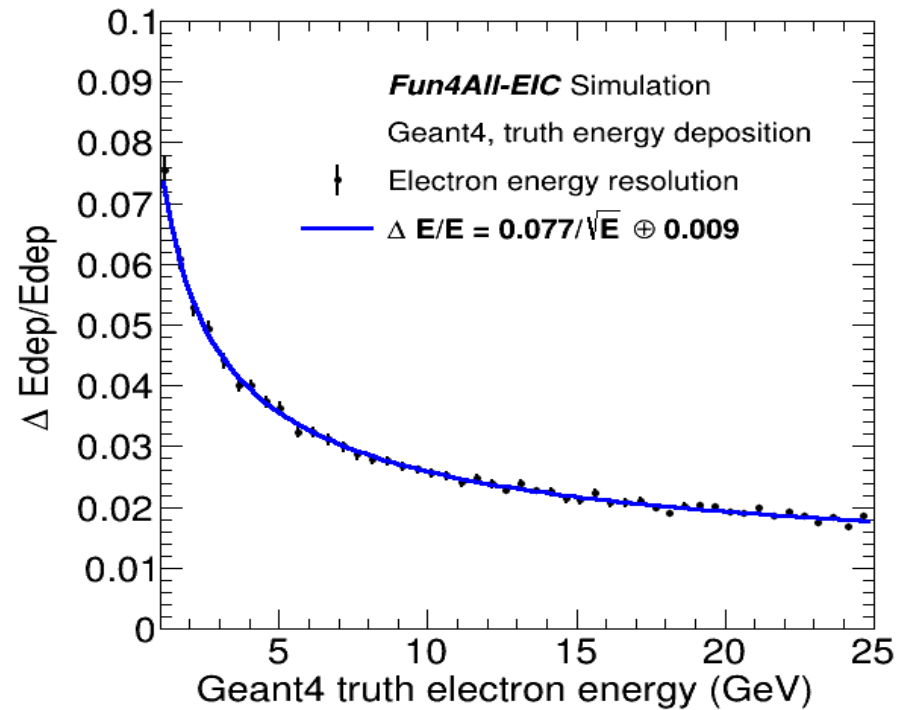


- 80% W/20 % Cu Alloy ($X_0 = 4.1$ mm)
- 38 x 38 x 1.58 mm absorber plates (0.39 X_0)
- 1.63 mm scintillating tiles
- Total Stack: 80 W/Cu plates + 79 tiles (31 X_0 , 268 mm)
- Each WLS fiber is read out by its own SiPM
- Total length including SiPMs: 282 mm



3x3 array of W/Shashlik modules
built at UTFSM in Chile and sent
to BNL for testing

Shashlik Energy Resolution



GEANT simulation of a W/Shashlik calorimeter with 80W/20Cu absorber plates with the same fraction and sampling frequency as the 3x3 prototype and a total radiation length of 26 X₀.